Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

II SEMESTER M.TECH (CAMDA) END SEMESTER EXAMINATIONS

MAY 2016

SUBJECT: ADVANCED MECHANISMS AND DESIGN (PE-III) [MME 567]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Additional data required may be appropriately assumed
- Assumptions made must be clearly mentioned
- Use of data hand book is permitted

1A. Synthesize a four bar mechanism to generate a function y = sin (x) for 0° ≤ x ≤ 90° for the input range of $\Delta\varphi$ = 120° (choose starting angle as 97°) and the output range of $\Delta\psi$ = 60° (choose starting angle as 60°) for three precison points. Use the Freudenstein's equation to determine the values of all the links. Take r_1=100 mm. **(07)**

1B. A crank and rocker is to have a rocker 6 ft in length and rocking angle of 75°. If the time ratio is to be 1.32, what are suitable set of link lengths for remaining three links? **(03)**

2A. Explain three position synthesis of four bar mechanism using relative pole method. **(04)**

2B. Define spatial mechanism. Explain mobility equation for spatial mechanism with PSGC as an example. **(03)**

2C. Design a slider crank mechanism such that φ_{12}=30°, φ_{23}=50° and S_{12}=25 cm, S_{23}=20 cm. The link moves in the clockwise sense while the output slider moves away from fixed point O_2. **(03)**

3A. Derive Bloch's method for synthesizing four bar mechanism. **(05)**

3B. Design the three cognates for the given mechanism shown in **Fig.Q.3B**. **(05)**

4A. In a slider crank mechanism, the driving crank rotates with a uniform angular velocity of 10 rad/s. The length of the crank is 60 mm and the length of the connecting rod is 120 mm. Determine the velocity and acceleration of slider at crank positions defined by $\theta = 45^0$ & 55^0 and σ =+1. **(07)**

4B. Write a short note on balancing of a single cylinder reciprocating engine. **(03)**

5A. **Fig.Q.5A** shows a cam with a reciprocating–roller follower system. Various forces acting on the follower are indicated in the figure. At the instant, an external force F_1 of 40 N, a spring force F_2 of 15 N and cam force F_5 of unknown magnitude act on it along the lines of action as shown. F_3 and F_4 are the bearing reactions. Determine the magnitude of the forces F_3, F_4 and F_5 neglecting friction. **(05)**

5B. Determine the primary and secondary inertia forces and couples in a six cylinder inline engine. **(03)**

5C. Explain how the inertia force varies (only in direction) in case of a 60^0 V2 Engine. **(02)**

6A. For the Watt 'walking beam' mechanism shown in **Fig.Q.6A**, dimensions O_2O_5 = 30 mm, BC = 37 mm, CD = 17 mm, BD = 52 mm. Dimensions of link 2, 3 & 5 are 21 mm, 25 mm & 25 mm respectively. Angles O_5O_2A = 60^o, CO_5O_2 = 100^o.If ω_2 = 10 rad/s, determine the velocity of slider (link 6). Use auxiliary point method. Also show two auxiliary points. **(08)**

6B. Discuss about equivalent offset inertia force? **(02)**

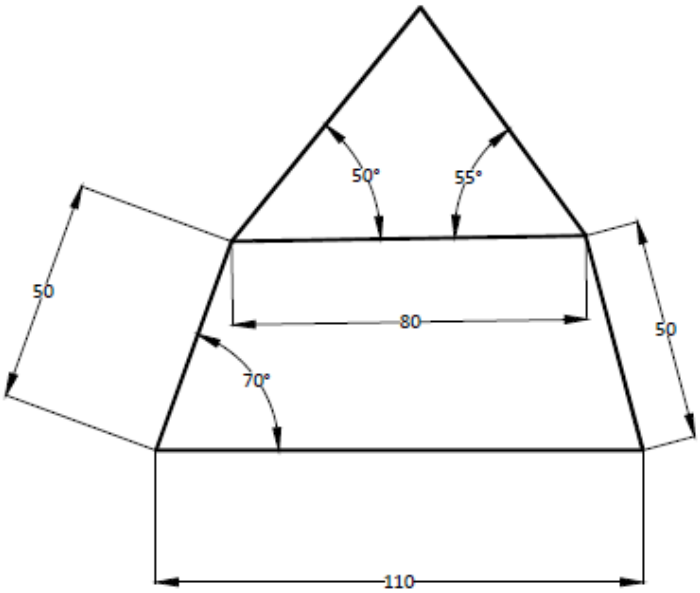

Fig.Q.3B

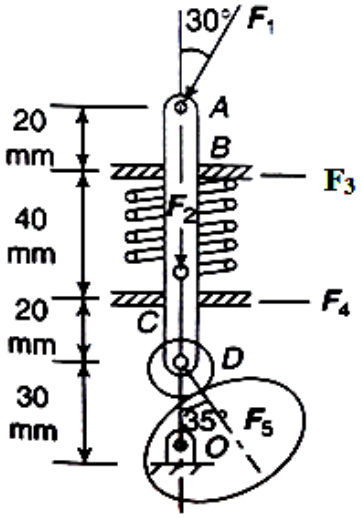

Fig.Q.5A

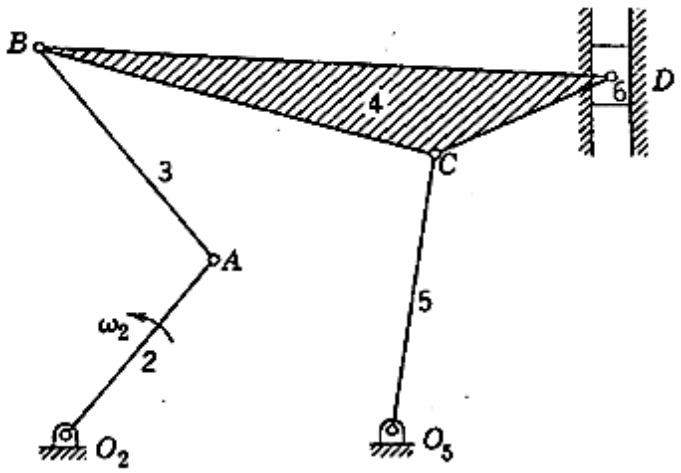

Fig.Q.6A